

# Development of a Blended Physiotherapeutic Module for Young Adults with Non-Specific Chronic Low Back Pain: A Feasibility Study

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## ABSTRACT

**Introduction:** Non-Specific Chronic Low Back Pain (NSCLBP) is a prevalent non-communicable disease in India, burdening individuals psychologically and socially. Due to economic constraints, people prefer self-management rather than seeking professional advice. Therefore, their go-to search strategy for self-management is social media platforms. Many researchers have identified a lack of evidence in these social media videos.

**Aim:** To develop and evaluate the feasibility of a blended physiotherapeutic module for young adults with NSCLBP.

**Materials and Methods:** This feasibility study was conducted at Nitte Institute of Physiotherapy, NITTE (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India from July 2023 to December 2023. This study involved three phases: identifying modifiable risk factors for exercise adherence in individuals with NSCLBP, developing a module, and evaluating its feasibility. Twenty-four young individuals with low back pain were given the blended physiotherapeutic module for four weeks, consisting of three sessions per week. The first two sessions were conducted online, and the following session was face-to-face. The data were analysed using SPSS software

(SPSS Inc.; Chicago, IL) version 29.0.10. The collected data were summarised using Descriptive Statistics: frequency, percentage; mean, and Standard Deviation (SD). To compare the Quebec Back Pain Disability Scale (QBPD) and Numerical Pain Rating Scale (NPRS) scores, repeated measures ANOVA was employed. The Bonferroni test was utilised for pairwise comparisons of QBPD and NPRS scores. A p-value <0.05 was considered significant.

**Results:** In this study, the average percentage of individuals who performed exercises for four weeks was 22 (91.7%), indicating high adherence. There was a significant difference (p-value <0.05) in the QBPD as well as the NPRS from baseline to weeks -2, 3, and 4.

**Conclusion:** The developed blended physiotherapeutic module for NSCLBP individuals was found to be feasible. Positive results were identified in reducing pain and disability after two weeks. This study aids individuals struggling with physiotherapy exercises in a digitalised society, suggesting that future research could incorporate real-time movement analysis and regional language databases and software that should be validated.

**Keywords:** Adherence, Digital health, Exercise training, Physiotherapy, Telerehabilitation

## INTRODUCTION

Chronic pain lasts beyond twelve weeks. It can also be divided into non-specific and specific types. Specific low back pain originates in the spine due to a particular disease or anatomical issue, while non-specific low back pain occurs when a specific disease or structural cause cannot be found. In over 90% of cases, the pain is non-specific [1]. Worldwide, 619 million people suffer from low back pain [2]. A study indicated that low back pain is frequent among Indian young adults aged 18-35, with a rate of 42.4% annually and 22.8% weekly [3]. Prolonged low back pain can lead to decreased work productivity, financial burdens, and limited movement, impacting school, work, and community participation. Therefore, appropriate management is necessary [1].

Numerous guidelines state that exercise is the best course of treatment for low back pain, but they also point out that there is no proof that one type of exercise is better than another [4]. A significant issue for a physiotherapist is when patients do not follow their prescribed exercise regimen [5]. A research indicates that younger individuals are more likely to drop out or not adhere to treatment [6]. Understanding poor adherence to exercise is crucial for treatment success and symptom recurrence. Factors like low self-efficacy, fear of pain, and the inability to incorporate exercises into daily life can hinder adherence [7-9].

Appropriate action must be taken to develop suitable programmes for the management and prevention of low back pain in society since it harms a person's quality of life [10]. Digital health tools,

accessible through computers, mobile phones, or web-based applications, are a new approach to enhance empowerment and self-education among individuals [11]. According to a systematic review, persons with persistent low back pain are becoming more and more comfortable with utilising health applications. They found three excellent apps, but there is no proof that they help with patient outcomes [12]. Patients find new technology like virtual reality and information and communication technologies appealing but cannot replace personal interaction between the patient and the caregivers [13].

The combination of web-based physiotherapy and supervised physiotherapy is referred to as 'blended physiotherapeutic care' [14]. Studies in the Netherlands have reported a blended physiotherapeutic module for low back pain and hip or knee osteoarthritis, with patients expressing high satisfaction [15-19]. There are several reasons why people in India are not adhering to physiotherapy management, and the social media videos available are not supported by research. To date, no research has been conducted in India to demonstrate the feasibility of a blended physiotherapeutic module for young people suffering from NSCLBP.

Therefore, the aim of the study was to develop a blended physiotherapeutic module and evaluate the feasibility among young adults with NSCLBP. The primary objective was to identify individual factors inhibiting adherence to the face-to-face intervention and the effect of a blended physiotherapeutic module on functional disability and pain.

## MATERIALS AND METHODS

This feasibility study was conducted among young adults at Nitte Institute of Physiotherapy, NITTE (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India from July 2023 to December 2023.

Ethical clearance for this study was obtained from the Nitte Institutional Ethics Committee of Nitte Institute of Physiotherapy, Mangaluru, Karnataka, India on 09-02-2023 (Ref: NIPT/IEC/Min//12/2022-2023). This study was registered with the Clinical Trial Registry-India on 28/04/2023 with the registration number CTRI/2023/04/052097. Before participation, all participants were provided with information about the trial process, and informed consent was obtained from each participant. Participants were informed that they could withdraw from the trial at any point if they were unwilling to continue.

**Inclusion criteria:** Young adults aged 18-25 years with NSCLBP, individuals experiencing pain lasting more than 12 weeks, and those with a NPRS of 3 or less [20] were included in this study. Participants falling under the low and Medium-risk categories in the Keele STarT Back Screening Tool [21] were eligible, provided they could read and understand English.

This study specifically included individuals with a NPRS of 3 or less because those with severe pain may struggle to establish an exercise routine and may anticipate higher levels of pain [22]. Additionally, the study involved a blended physiotherapeutic module, a novel approach that required participants to perform unsupervised exercises two days a week, potentially increasing the risk of pain provocation.

The Keele STarT Back Screening Tool consists of a 9-item screening form incorporating physical and psychosocial elements. It categorises individuals with low back pain into three groups (high-risk, medium-risk, and low-risk) based on their risk of chronicity. Those scoring between 0-3 are classified as low-risk, while those scoring >3 overall but <4 in psychosocial items are classified as medium-risk. Individuals scoring >3 overall and >=4 in psychosocial items are categorised as high-risk, requiring additional structured interventions compared to medium and low-risk individuals [21].

**Exclusion criteria:** Contraindications for physical activity, as outlined in the Physical Activity Readiness Questionnaire (PAR-Q) [23], include individuals with a body mass index greater than 30 [24] and those who do not have access to the Internet.

**Study population and sampling strategy:** Twenty four young adults were included using the purposive sampling method. A study conducted in the Netherlands observed a 90% adherence rate to blended physiotherapeutic intervention (37 out of 41). With an absolute precision of 13%, the estimated sample size for this study is 21. Additionally, assuming a 10% non-response rate, the required sample size for the study is  $21+3=24$  [19].

### Procedure

#### Phase 1: Identification of the risk factors for adherence

A comprehensive literature review was conducted to identify global risk factors faced by individuals with low back pain in terms of exercise adherence. The primary objective of this review was to reduce the impact of barriers to exercise adherence and assist physiotherapists in recognising patients at risk of non-adherence so they can plan accordingly. The identified domains included physical, psychological, socio-economic, occupational, and accessibility factors, which were further categorised into modifiable and non-modifiable risk factors [Annexure-1]. Articles that identified risk factors through qualitative research methods were included

because qualitative research is considered the most effective way to understand and identify patients' needs, representing a person-centred and humanistic approach to uncovering patients' thoughts and actions [25].

#### Phase 2: Module development

The blended physiotherapeutic module comprised a real-time exercise module and an educational module. For the online intervention mode, the exercise module video was recorded in the research lab using a cell phone and tripod. The tripod's height was adjusted and maintained consistently throughout the exercise video recording. This module included six exercises selected for their safety and simplicity in treating chronic non-specific low back pain patients. The exercises featured in the module were pelvic bridging, pelvic bridging with one leg lift, crunches, cycling, plank, and alternate arm and leg elevation in the quadruped position [Table/Fig-1,2]. These exercises were real-time-based and provided instructions for proper execution [Annexure-2].



[Table/Fig-1]: Participant performing exercise in face-to-face intervention (Pelvic bridging).



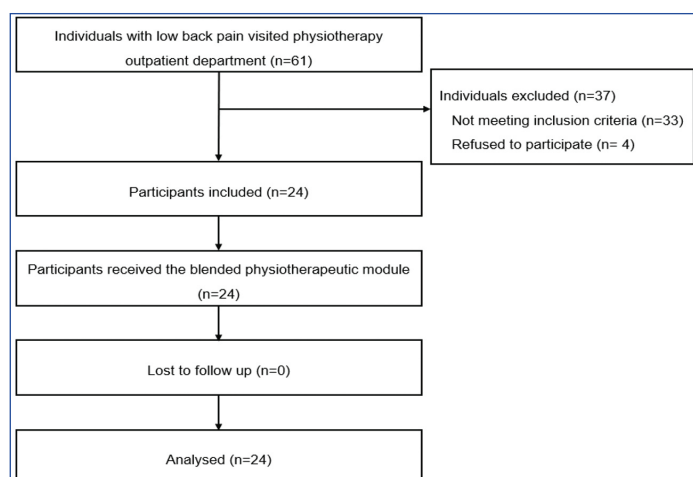
[Table/Fig-2]: Participant performing exercise in face-to-face intervention (Plank).

The educational component video aimed to raise awareness about NSCLBP, its causes, misconceptions, do's and don'ts, reasons for non-adherence, and the benefits and importance of exercise. Instruction audio for the online mode was recorded separately and then integrated with the previously recorded educational video.

#### Phase 3: Feasibility evaluation

The flow chart illustrating the feasibility evaluation phase is depicted in [Table/Fig-3]. The feasibility of the blended physiotherapeutic module was evaluated during this phase. Individuals presenting with low

back pain at the Physiotherapy Outpatient Department (OPD) were assessed to determine if they met the inclusion criteria. Out of 61 individuals who visited the physiotherapy OPD, 24 participants were included in the study. Informed consent was obtained from all the participants included, and baseline data was collected.



[Table/Fig-3]: Flow chart representing the feasibility evaluation phase.

The study utilised the Google Classroom app due to its user-friendly and cost-effective nature, as most participants were active users, to share module links for the online mode intervention. A total of four weeks of intervention was provided, with each week consisting of three alternative days of exercise intervention: two sessions of online mode intervention and one session of face-to-face intervention. Participants were provided with a list of warm-up and cool-down exercises to choose from according to their convenience.

**All 24 participants were reminded twice a week:** Once on the previous day of their online mode intervention through the WhatsApp group created for this purpose, and again on the same day through the Google Classroom app. Links to the online session videos and instructions were shared in the Google Classroom application, along with the list of warm-up and cool-down exercises (refer to [Annexure 2]). Participants were also given weekly logs to record their daily exercise timings.

Participants were required to visit the physiotherapy OPD every third alternative day for the face-to-face intervention, which mirrored the online mode intervention. The QBPDS and NPRS were recorded during the face-to-face sessions every week for four weeks. At the end of the 4<sup>th</sup> week, the weekly logs were collected from the participants. There were no dropouts in the study, and no adverse events were reported.

The QBPDS was utilised to measure functional disability. It is a 20-item scale that encompasses all types of physical activities relevant to back pain. The total scores range from 0 (indicating no disability) to 100 (representing total disability) [26,27]. The NPRS is an 11-point scale, with total points ranging from 0 (indicating no pain) to 10 (representing the worst possible pain) [20]. The proposed minimal important change values for the NPRS are 2 and for QBDPS are 20 [28].

### STATISTICAL ANALYSIS

The data were analysed using SPSS software (SPSS Inc.; Chicago, IL) version 29.0.10. The collected data were summarised using Descriptive Statistics: frequency, percentage; mean, and Standard Deviation (SD). To compare the QBPDS and NPRS scores, repeated measures ANOVA was employed.

The Bonferroni test was utilised for pairwise comparisons of QBPDS and NPRS scores. A p-value <0.05 was considered significant.

### RESULTS

In phase 1 of the study, factors affecting individuals with NSCLBP in adhering to exercise were identified and subcategorised into modifiable and non-modifiable risk factors (refer to [Annexure-1]). This study addressed some of the identified barriers in the educational module.

A total of 61 individuals were screened for inclusion and exclusion criteria. Among them, 37 participants were excluded, with four choosing not to participate and 33 not meeting the inclusion criteria. Twenty four participants who met the inclusion criteria were selected and included in the study using the purposive sampling method. There were no dropouts during the study.

The descriptive statistics for age, height, and weight are presented in [Table/Fig-4].

Among the 24 participants, there were more female participants (n=19) compared to males (n=5) in this study. The duration of low back pain for only one participant was six to eight years [Table/Fig-5].

Variables (N=24)	Range	Mean	Standard Deviation (SD)
Age (Years)	20 to 24	22.9	1.4
Height (cm)	145 to 184	161.0	9.0
Weight (Kg)	43 to 77	57.0	10.5

[Table/Fig-4]: Descriptive statistics for age, height, weight.

Variables (N=24)	Frequency	Percentage (%)	
Gender	Male	5	20.8
	Female	19	79.2
Body mass index	Underweight (<18.5)	5	20.8
	Normal weight (18.5 to 25)	15	62.5
	Overweight (25 to 30)	4	16.7
Education	Pre-university	5	20.8
	Undergraduate	19	79.2
Occupation	Unemployed (students)	24	100
Low back pain duration	<6 months	2	8.3
	6 months to 1 year	7	29.2
	1 to 2 years	3	12.5
	2 to 4 years	7	29.2
	4 to 6 years	4	16.7
Keele start back screening tool (21)	6 to 8 years	1	4.2
	Low-risk	9	37.5
	Medium-risk	15	62.5

[Table/Fig-5]: Demographic characteristics.

On days 1 and 2 of each week, the intervention was conducted online, and on day 3 of each week, a face-to-face session took place. During the face-to-face sessions (Day 3 of weeks 1, 2, and 3), 22 participants completed all the exercises along with warm-up and cool-down, and 23 participants completed them in week 4. In the online mode intervention, not all participants who performed exercises also completed the warm-up and cool-down exercises. Only on Day 2 of the 4<sup>th</sup> week, all 24 participants performed the exercises, but only a few did the warm-up and cool-down exercises (n=18) [Table/Fig-6].

The repeated measures ANOVA was utilised to compare QBPDS scores. There was a significant difference (p<0.001) in QBPDS scores across the measurements [Table/Fig-7].

The repeated measures ANOVA were used to compare the NPRS. There was a significant difference (p<0.05) in NPRS scores across the measurements [Table/Fig-8].

			Exercise		Warm-up		Cool-down	
			n	%	n	%	n	%
Week-1	Day-1	Done	23	95.8	15	62.5	15	62.5
		Not done	1	4.2	9	37.5	9	37.5
	Day-2	Done	22	91.7	15	62.5	15	62.5
		Not done	2	8.3	9	37.5	9	37.5
	Day-3	Done	22	91.7	22	91.7	22	91.7
		Not done	2	8.3	2	8.3	2	8.3
Week-2	Day-1	Done	21	87.5	14	58.3	14	58.3
		Not done	3	12.5	10	41.7	10	41.7
	Day-2	Done	22	91.7	17	70.8	17	70.8
		Not done	2	8.3	7	29.2	7	29.2
	Day-3	Done	22	91.7	22	91.7	22	91.7
		Not done	2	8.3	2	8.3	2	8.3
Week-3	Day-1	Done	22	91.7	16	66.7	16	66.7
		Not done	2	8.3	8	33.3	8	33.3
	Day-2	Done	23	95.8	17	70.8	17	70.8
		Not done	1	4.2	7	29.2	7	29.2
	Day-3	Done	22	91.7	22	91.7	22	91.7
		Not done	2	8.3	2	8.3	2	8.3
Week-4	Day-1	Done	23	95.8	17	70.8	17	70.8
		Not done	1	4.2	7	29.2	7	29.2
	Day-2	Done	24	100	18	75	18	75
		Not done	0	0	6	25	6	25
	Day-3	Done	23	95.8	23	95.8	23	95.8
		Not done	1	4.2	1	4.2	1	4.2

**[Table/Fig-6]:** Weekly log for blended physiotherapeutic module.

QBPDS	Mean	SD	"F"	p-value
Baseline	16.83	8.86	20.04	< 0.001*
Week-1	16.04	8.83		
Week-2	13.79	6.69		
Week-3	10.96	5.31		
Week-4	10.00	5.82		

**[Table/Fig-7]:** Comparison of Quebec Back Pain Disability Scale (QBPDS). ("F"= Repeated measures ANOVA; \* Significant)

NPRS	Mean	SD	"F"	p-value
Baseline	2.46	0.66	16.25	<0.001*
Week-1	2.46	0.59		
Week-2	1.83	0.57		
Week-3	1.63	0.71		
Week-4	1.46	0.98		

**[Table/Fig-8]:** Comparison of Numerical Pain Rating Scale (NPRS). ("F"= Repeated measures ANOVA; \* Significant)

The Bonferroni test was used for the pairwise comparisons of QBPDS and NPRS. There were significant differences (p-value <0.05) in both QBPDS and NPRS scores from baseline to Weeks -2, 3, and 4. Additionally, QBPDS showed significant differences (p-value <0.05) from week-1 to weeks 3 and 4, as well as from week-2 to weeks 3 and 4. NPRS exhibited significant differences (p-value <0.05) from week-1 to weeks 2, 3, and 4 [Table/Fig-9].

## DISCUSSION

The primary aim of the present research was to develop and assess the feasibility of the blended physiotherapeutic module in individuals with NSCLBP. The study consisted of two modules: the educational module and the video-instructed real-time exercises module. A personalised intervention could not be implemented due

Pairwise comparisons		Quebec pain disability scale		Numerical pain disability scale	
		Mean difference	p-value	Mean difference	p-value
Baseline	Week-1	0.79	0.100	0.00	1.000
	Week-2	3.04	0.007*	0.63	0.003*
	Week-3	5.88	0.002*	0.83	<0.001*
	Week-4	6.83	<0.001*	1.00	<0.001*
Week-1	Week-2	2.25	0.061	0.63	0.003*
	Week-3	5.08	0.010*	0.83	0.001*
	Week-4	6.04	<0.001*	1.00	0.001*
Week-2	Week-3	2.83	0.042*	0.21	1.000
	Week-4	3.79	0.001*	0.38	0.470
Week-3	Week-4	0.96	1.000	0.17	1.000

**[Table/Fig-9]:** Pairwise comparisons of QBPDS and NPRS. (The bonferroni test is used; \*Significant)

to a limited physiotherapist-to-patient ratio. The Google Classroom application was chosen for the online mode intervention as it was user-friendly, cost-effective, and familiar to most participants.

In contrast, a study conducted in the Netherlands developed a blended physiotherapeutic module for non-specific low back pain patients. Their intervention included three modules: an educational video, an exercise video, and physical activity recommendations, which were provided over a period of 12 weeks [19].

In this study, the average percentage of individuals who performed exercises for four weeks was 22 out of 24 (91.7%), indicating high adherence, which is consistent with a study that reported the feasibility of a blended physiotherapeutic module [18].

In the present study, only one day per week of face-to-face intervention was included because previous studies have shown that in physiotherapy, home-based exercises are crucial for patients with low back pain, and technology cannot replace the human relationship between the therapist and the patient [13,29].

The educational module and exercise module were included in the present study to enhance understanding and awareness of low back pain, reduce pain concerns and feelings of dependency, and improve feelings of optimism and treatment expectations [30-32]. Many guidelines also suggest that education should be the primary strategy, with exercise as a secondary strategy for the treatment of chronic low back pain [1,4,33]. The exercises selected in the present study were chosen with the safety of participants in mind, as they had to perform them twice a week without supervision. This approach aligns with a study that emphasises considering factors such as accessibility, cost, suitability, and preferences when selecting the right exercises for patients with chronic low back pain [34].

In our study, after four weeks of follow-up, a reduction in pain intensity and disability was observed. A significant difference (p-value <0.001\*) was noted in QBPDS and NPRS scores from baseline to week 4. These findings are consistent with studies that have shown both supervised and online interventions to be effective in reducing pain and disability and improving an individual's functional performance in non-specific low back pain cases [35-37]. The study conducted in the Netherlands on patients with non-specific low back pain also demonstrated positive results in pain reduction and improvement in functional performance [18,19].

There is no such database for the Indian population who are suffering from chronic low back pain. Since low back pain is highly prevalent in India and post-COVID-19 online mode of intervention is recognised as a promising approach to managing

chronic conditions [38,39], a systematic review found that low back pain poses an economic burden on individuals in low and middle-income countries [40]. So, there is a need for Indian physiotherapists to develop databases in regional languages. The good life with osteoArthritis in Denmark (GLA:D) manual is one such comprehensive database designed to treat knee and hip osteoarthritis. It includes supervised exercises and structured advice on physical activity [41]. To the best of the author's knowledge, there have been no studies done in India on a blended physiotherapeutic approach. This study has paved the way for further studies in India and has also saved time and reduced the cost of resources. Future studies can be done by including other age groups, subgroup analysis, real-time movement analysis, a larger sample size with a control group among chronic non-specific low back pain individuals. The strength of this study was that the prescribed exercises were simple and real-time, and the module was less time-consuming and accessible.

### Limitation(s)

This study has certain limitations as the findings of the study cannot be generalised to the whole population of individuals with chronic non-specific low back pain. The level of pain was moderate during the baseline (NPRS= $<3$  is included in the study), and the long-term benefits were not measured.

### CONCLUSION(S)

The blended physiotherapeutic module was developed for young adults with NSCLBP and was found to be feasible. The factors affecting adherence to exercise were also identified. Positive results were observed in reducing pain and disability after the second week of the intervention.

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